MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology
Standard Reference Materials Program
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SRM Number: 3129a
MSDS Number: 3129a
SRM Name: Lithium Standard Solution
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SECTION I. MATERIAL IDENTIFICATION

Material Name: Lithium Standard Solution

Description: SRM 3129a is a single element solution prepared gravimetrically to contain a nominal mass fraction of 10 mg/g of lithium with a nitric acid volume fraction of 1 %.

Other Designations: Lithium (lithium metal; lithium element) in **Nitric Acid** (aqua fortis; hydrogen nitrate; azotic acid; nitryl hydroxide; natal); **Lithium Nitrate**[a] (nitric acid, lithium salt) in **Standard Solution**

Name	Chemical Formula	CAS Registry Number
Nitric Acid	HNO_3	7697-37-2
Lithium Nitrate	$LiNO_3$	7790-69-4
Lithium	Li	7439-93-2

[a]The addition of lithium to nitric acid, along with other intermediate chemical reactions, forms lithium nitrate, which will precipitate upon evaporation or drying of the solution.

DOT Classification: Nitric Acid Solution, UN2031

SECTION II. HAZARDOUS INGREDIENTS

Hazardous Components	Nominal Concentration (%)	Exposure Limits and Toxicity Data
Nitric Acid	1.0	ACGIH TWA: 5 mg/m^3
		ACGIH STEL: 10 mg/m^3
		OSHA STEL: 10 mg/m^3
		OSHA TWA: 5 mg/m^3
		Rat, Inhalation: LC_{50}: 6250 mg/m^3/1 h
		Human, Oral: LD_{LO}: 430 mg/kg
Lithium Nitrate	9.93	No occupational exposure limits established
Lithium	1.0	No occupational exposure limits established
		Rabbit, Subcutaneous: LD_{LO}: 4 000 mg/kg
		Mouse, Intraperitoneal: LD_{50}: 1 g/kg
		Dog, Intravenous: LD_{LO}: 325 mg/kg

NOTE: The exposure limits and toxicity data are for the pure components. Data **DO NOT** exist for this lithium/nitric acid solution.

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Nitric Acid	Lithium Nitrate	Lithium
Appearance and Odor: a white to slightly yellow liquid that darkens to a brownish color upon aging and exposure to light; characteristic choking, nitrogen dioxide odor	**Appearance and Odor:** colorless, deliquescent crystals, granules, or powder	**Appearance and Odor:** a silvery-white solid; changes color on exposure to moist air; odorless
Molecular Weight: 63.01	**Molecular Weight:** 68.95	**Molecular Weight:** 6.941
Specific Gravity: 1.0543 (10% nitric acid)	**Specific Gravity (water = 1):** 2.38	**Specific Gravity (water =1):** 0.534
Boiling Point: 83 ºC	**Boiling Point:** not applicable	**Boiling Point:** 1317 - 1347 ºC
Freezing Point: - 42 ºC	**Melting Point:** 264 ºC	**Melting Point:** 179 - 181 ºC
Water Solubility: soluble	**Water Solubility:** 89.8 % soluble @ 28 ºC	**Water Solubility:** lithium reacts violently with water forming hydrogen and lithium compounds
Solvent Solubility: soluble in ether	**Solvent Solubility:** soluble in alcohol, pyridines, and ammonium hydroxide	**Solvent Solubility:** soluble in liquid ammonia, acids, and alcohol

NOTE: The physical and chemical data provided are for the pure components. Physical and chemical data for this lithium/nitric acid solution **DO NOT** exist. The actual behavior of the solution may differ from the individual components.

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Nitric Acid:

Flash Point: Not Applicable **Method Used:** Not Applicable **Autoignition Temperature:** Not Applicable

Flammability Limits in Air (Volume %): **UPPER:** Not Applicable
LOWER: Not Applicable

Lithium Nitrate:

Flash Point: Not Applicable **Method Used:** Not Applicable **Autoignition Temperature:** Not Applicable

Flammability Limits in Air (Volume %): **UPPER:** Not Applicable
LOWER: Not Applicable

Lithium:

Flash Point: Not Applicable **Method Used:** Not Applicable **Autoignition Temperature:** 179 ºC

Flammability Limits in Air (Volume %): **UPPER:** Not Applicable
LOWER: Not Applicable

Lithium Standard Solution:

Unusual Fire and Explosion Hazards: Nitric Acid and Lithium Nitrate are negligible fire hazards, oxidizers, and may ignite or explode on contact with combustibles materials. **Lithium** is a flammable solid; finely divided material may ignite or explode.

Extinguishing Media: Use an extinguishing agent most appropriate to extinguish surrounding fire. **DO NOT** use halogenated dry chemicals or extinguishing agents, carbon dioxide, or foam.

Special Fire Procedures: Fire fighters should wear a self-contained breathing apparatus (SCBA) with a full-face piece in the pressure demand or positive mode and other protective clothing.

SECTION V. REACTIVITY DATA

Lithium Standard Solution:

Stability: **X** **Stable** _____ **Unstable**

Stable under normal temperatures and pressures.

Conditions to Avoid: Avoid contact with combustible materials. Keep out of water supplies and sewers.

Hazardous Decomposition or Byproducts: Thermal decomposition can produce oxides of nitrogen and hydrogen compounds.

Hazardous Polymerization _____ **Will Occur** **X** **Will Not Occur**

Incompatibility (Materials to Avoid):

Nitric Acid: Nitric acid is incompatible with acids, combustible materials, halo carbons, amines, bases, oxidizing materials, metals, halogens, metal salts, metal oxides, reducing agents, peroxides, metal carbide, and cyanides.

Lithium Nitrate: Lithium nitrate is incompatible with acids, combustible materials, metal salts, and reducing agents.

Lithium: Lithium is incompatible with combustible materials, acids, metals, halogens, halo carbons, metal carbide, oxidizing materials, metal salts, reducing agents, and metal oxides.

SECTION VI. HEALTH HAZARD DATA

Route of Entry (Lithium Standard Solution):

X **Inhalation** **X** **Skin** **X** **Ingestion**

Health Hazards (Acute and Chronic): Nitric Acid is irritating to the respiratory system. Contact to the eyes, skin and mucous membranes can cause burns and pain.

Eye Contact: Direct eye contact may cause pain, lacrimation, photophobia, and burns, possibly severe. The degree of injury depends on the concentration and duration of contact. In mild burns, the epithelium regenerates rapidly and the eye recovers completely. In severe cases, the whole cornea may become deeply vascularized and opaque resulting in blindness. Repeated or prolonged exposure to acidic substances may cause conjunctivitis or effects as in acute exposure.

Skin Contact: Direct skin contact with liquid or vapor may cause severe pain and burns. Repeated or prolonged contact may result in dermatitis or effects similar to acute exposure. Effects depend on the concentration and duration of exposure.

Inhalation: Inhalation of acidic substances may cause severe respiratory irritation with coughing, choking, and possibly burns of the mucous membranes. Other initial symptoms may include dizziness, headache, nausea, and weakness. Pulmonary edema may be immediate in the most severe exposures. Death due to anoxia may occur within a few hours after onset of the symptoms of pulmonary edema or following a relapse. Repeated or prolonged exposure may cause erosion of the teeth, inflammatory and ulcerative changes in the mouth, and possible jaw necrosis. Bronchial irritation with cough and frequent attacks of bronchial pneumonia may occur.

Ingestion: Ingestion of nitric acid may cause burns, corrosion of the mucous membranes of the mouth, throat, and esophagus, pain, and difficulty to swallow or speak. Epiglottal edema may result in respiratory distress and possibly asphyxia. Shock with marked hypotension, weak, rapid pulse, shallow respiration, and clammy skin may occur. Circulatory collapse may ensue and if uncorrected, lead to renal failure. Depending on the concentration, repeated ingestion of acidic substances may result in inflammatory and ulcerative changes in the mucous membranes of the mouth and other effects as in acute ingestion.

Lithium Nitrate can be irritating to the respiratory system, skin, and eyes. Ingestion may be harmful.

Eye Contact: Dust may irritate the eyes. There is no data available for chronic exposure.

Skin Contact: Lithium nitrate may cause irritation to the skin. No data is available for chronic exposure.

Inhalation: Dust may cause irritation of the mucous membranes. Sufficient quantities absorbed may cause systemic poisoning with symptoms similar to those of ingestion. There is no data available for chronic exposure.

Ingestion: Ingestion may cause irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting, thirst, and diarrhea. Ingestion of large amounts may cause severe gastroenteritis and effects on the central nervous system, renal function, and fluid and electrolyte balance. Symptoms are similar to small amounts ingested in addition to blurred vision, drowsiness, weakness, tremor, staggering, bradycardia, and coma. Chronic exposure may cause symptoms as detailed in acute ingestion.

Lithium may cause burns to the respiratory system, eyes, skin, and mucous membranes.

Eye Contact: When lithium comes in contact with moisture, it will cause irritation and pain. Acute exposure will cause burns to the eyes. There may be edema, destruction of epithelium, corneal opacification and irititis. Later possible complications include scarring of the cornea, permanent opacity, cataract, and even blindness. Repeated or prolonged contact may result in conjunctivitis or effects as in acute exposure.

Skin Contact: Contact with skin causes irritation and burns. Chronic exposure effects depend on the concentration and duration of exposure. Effects may include dermatitis or effects similar to acute exposure.

Inhalation: When lithium comes in contact with moisture, it will cause irritation of the respiratory tract with coughing, choking, pain, and possibly burns of the mucous membranes. Inhalation may sometimes cause pulmonary edema. Symptoms may include tightness in the chest, dyspnea, and dizziness. Severe cases may be fatal. Chronic exposure effects depend on the concentration and duration of exposure. Effects may include inflammation, ulcers in the mouth, and effects similar to acute exposure.

Ingestion: Ingestion of lithium may cause burns. Symptoms include esophagus and stomach burning, pain, vomiting, and diarrhea. Epiglottal edema may result in respiratory distress and possibly asphyxia. Shock, weak and rapid pulse, shallow respiration, and clammy skin may occur. In severe cases, esophageal or gastric perforation are possible. Depending on the concentration, repeated ingestion may result in effects similar with acute ingestion.

Listed as a Carcinogen/Potential Carcinogen (Nitric Acid, Lithium Nitrate, Lithium):

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens		X
In the International Agency for Research on Cancer (IARC) Monographs		X
By the Occupational Safety and Health Administration (OSHA)		X

EMERGENCY AND FIRST AID PROCEDURES (Lithium Standard Solution):

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Obtain immediate medical assistance.

Skin Contact: Remove contaminated shoes and clothing. Rinse affected area with large amounts of water followed by washing the area with soap and water. Watch for chemical irritation. Obtain medical assistance if necessary.

Inhalation: If inhaled, move the victim to fresh air. If breathing is difficult, give oxygen; if the victim is not breathing, give artificial respiration. Obtain medical assistance if necessary.

Ingestion: If ingestion occurs, wash out mouth with water. **DO NOT** induce vomiting. If person is unconscious, turn head to side. Obtain immediate medical assistance.

Target Organ(s) of Attack for Nitric Acid and Lithium: skin, eyes, upper respiratory tract, and mucous membranes.

SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled: Notify safety personnel of spills. Avoid contact with combustible materials. Do not touch spilled material. For small liquid spills, absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal.

Waste Disposal: Follow all federal, state, and local laws governing disposal.

Handling and Storage: Provide approved respiratory apparatus for emergency use. Use an approved filter and vapor respirator when the vapor or mist concentrations are high. Wear gloves and chemical safety glasses where contact with the liquid or high vapor concentrations may occur. An eye wash station and washing facilities should be readily available near handling and use areas.

NOTE: Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

Store in accordance with all current regulations and standards. Keep separated from incompatible substances.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Sources:
MDL Information Systems, Inc., MSDS *Lithium*, 19 March 2003.
MDL Information Systems, Inc., MSDS *Lithium Nitrate*, 19 March 2003.
MDL Information Systems, Inc., MSDS *Nitric Acid*, 19 March 2003.